# Friendship Heights Transportation Study Addendum

*Final Report*

**Prepared for:**
**The District of Columbia Department of Transportation**

**Prepared by:**
**The Louis Berger Group, Inc.**

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# 1 INTRODUCTION

## 1.1 BACKGROUND

The Friendship Heights Addendum (FHTSA) reports on transportation analysis and recommendations for two separate but related sections of northwest Washington, DC: future traffic conditions related to specific development projects in Friendship Heights, and potential infrastructure improvements and traffic management recommendations for three intersections along River Road. Both of these studies for the FHTSA were conducted concurrent with the Wisconsin Avenue Corridor Transportation Study (WACTS).

The District Department of Transportation (DDOT) conducted the Friendship Heights Transportation Study (FHTS) in 2003. Subsequent to that study, the DC Office of Planning (OP) released the Draft Revised Upper Wisconsin Avenue Corridor Study (UWACS) Strategic Framework Plan that proposed more development in the Friendship Heights area than had been considered in the FHTS. OP and residents requested an update to the FHTS to examine the future traffic conditions that would be anticipated as a result of this more intense development. They also requested an evaluation of the future traffic conditions, taking into account the traffic management and infrastructure improvements that were recommended in the FHTS, identifying additional improvements (if condition worsen and improvements are feasible).

DDOT also identified three intersections along River Road that deserved study, but were outside the scope of the WACTS. Ward 3 citizens have expressed concerns regarding traffic congestion, neighborhood cut-through traffic along River Road, and the potential exacerbation of these issues related to anticipated development in the Friendship Heights and Tenleytown Metrorail station areas. The FHTSA became the vehicle for the data collection and analysis of these intersections near the Maryland border.

The Louis Berger Group, Inc. (Consultant) was contracted to conduct the study with assistance from DDOT staff and OP staff. This report refers to the Consultant team and DDOT and OP staff as the "Study Team."

## 1.2 STUDY PURPOSE

There are two main purposes for the addendum. First, the study identifies potential impacts of specific Friendship Heights development proposals on future traffic conditions, and the resulting need for additional traffic management and/or infrastructure improvements (beyond those already prescribed in the FHTS). Second, the study examines existing and future traffic conditions for the selected River Road corridor intersections. The study then identifies short-term and long-term traffic management and infrastructure improvements along River Road to reduce traffic congestion, especially during peak morning and evening travel hours; improve traffic and pedestrian safety; and protect surrounding residential streets from traffic impacts.

The report is divided into six (6) chapters. Chapters 2 and 3 discuss Friendship Heights developments and the evaluation of FHTS recommendations, Chapters 4 and 5 discuss the River Road intersections and improvement recommendations, and Chapter 6 summarizes the findings. The chapters are as follows:

Chapter 1: Introduction
Chapter 2: Friendship Heights Future Condition with Anticipated Development
Chapter 3: Evaluation of Friendship Heights Transportation Study Recommendations with Additional Future Traffic
Chapter 4: Existing Condition of River Road Intersections and Future River Road Traffic Estimates and Traffic Conditions
Chapter 5: Short- and Long-term Improvement Recommendations for River Road Intersections
Chapter 6: Summary

### 1.3 WISCONSIN AVENUE CORRIDOR TRANSPORTATION STUDY DEVELOPMENT SCENARIO TRAFFIC IMPACT ANALYSIS

The Study Team extended its effort outside of the FHTSA scope of work and evaluated traffic impact of WACTS development scenarios on FHTS intersections. Using the WACTS results for Scenarios 2, 3, and 4, additional traffic along Wisconsin Avenue and side streets was reevaluated. The analysis results are presented in Section 3.2.

## 2 FRIENDSHIP HEIGHTS FUTURE CONDITIONS WITH ANTICIPATED DEVELOPMENT

Traffic increases in a rather predictable manner with population growth and land use changes. The transportation study identifies the potential developments in the study area, evaluates their likely impact on traffic, and identifies suitable improvements (if feasible) to address projected deterioration in traffic conditions. The Study Team conducted the future condition analysis considering developments identified by OP under the FHTSA. The following section defines the future developments and the methodology used in the future condition analysis.

### 2.1 DEVELOPMENT CASES FOR FHTSA

As described in Section 1.1, the OP requested an analysis of future traffic conditions related to additional proposed developments in the Friendship Heights area, which are larger in scale than those considered as part of the 2003 Friendship Heights Transportation Study (FHTS). OP developed the list of additional developments and the zoning categories for the developments. The list was identified as the "potential development case" which represents sites with a high potential for redevelopment. The FHTSA future condition analysis is based on the potential development case. This case also served as input to Scenario 2 of the Wisconsin Avenue Corridor Transportation Study (WACTS)[1].

As noted earlier, the FHTSA was conducted concurrent with the WACTS. In order to reflect higher density build-up conditions in WACTS Scenario 3 (matter-of-right maximum) and Scenario 4 (planned-unit-development maximum), the Study Team prepared a high density case for development in Friendship Heights. This high development case is only applicable for the analysis with WACTS scenarios 3 and 4 and is not part of the FHTSA, except by reference for

[1] Discussed in the Wisconsin Avenue Corridor Transportation Study Final Report pages 61-66.

clarity. In other words, the FHTSA does not include a detailed analysis of the maximum development cases posited in the WACTS.

Exhibit 2-1 summarizes potential development sites included in the FHTSA development analysis.

**Exhibit 2-1: Development Scenarios in the Friendship Heights Area**

| Sites in the Friendship Heights Area[1] | Current Zoning | Potential Development Case (FHTSA and WACTS Scenario 2) | High Density Development Case (WACTS Scenarios 3 and 4) |
|---|---|---|---|
| Mazza Gallerie | C-3-A | Current zoning | C-R (PUD Max) |
| Parking Lot behind Mazza Gallerie | C-3-A | C-R (PUD Max) | C-R (PUD Max) |
| Lord and Taylor | C-2-A | C-2-C; C-2-A (PUD Max) | C-2-C/ C-2-A (PUD Max) |
| Lord and Taylor Parking Lot/Garage | C-2-A; R-5-B; R-2 | C-2-A; R-5-B; R4 (PUD Max) | C-2-A; R-5-B; R4 (PUD Max) |
| SW Corner of 44th and Jenifer Streets | C-2-A | Current zoning | C-2-C (PUD Max) |
| SW Corner of Wisconsin Avenue and Jenifer Street | C-2-B | Current zoning | C-2-C (PUD Max) |
| WMATA Bus Garage | C-2-B;R-5-B | C-2-C/ R-5-B (PUD Max) | C-2-C/ R-5-B (PUD Max) |
| Buick Dealership | R-5-B | C-2-C (PUD Max) | C-2-C (PUD Max) |
| NW Corner of Wisconsin Avenue and Harrison Street | R-5-B | Current zoning | C-2-A (PUD Max) |

Source: DC Office of Planning

Note: Any zoning change that might occur in Friendship Heights would derive from a landowner request in the form of a request for PUD development and PUD related map changes. Any zoning changes must go through the zoning commission approval process.

1) WMATA and Buick developments were analyzed in the Friendship Heights Transportation Study. Updated development information had since been made available; therefore the traffic impact analysis was redone for these two developments using the updated figures.

## 2.2 LAND USE DATA DEVELOPMENT

The Study Team assembled a land use database as a key input to the traffic impact analysis of additional developments in the FHTSA. The database was developed using the DC Office of Tax and Revenue Real Property Tax Administration Computer-Assisted Mass Appraisal (CAMA) database as a starting point. This is the most comprehensive District of Columbia property information available. Using the CAMA database, the Study Team was able to determine the existing and potential gross build area (GBA) under PUD. These gross build areas were then used to estimate the potential number of trips generated by each new development on a block by block basis.[2]

[2] A detailed discussion of the land use database development methodology and assumptions is presented in the WACTS final report pages 66-71.

Exhibit 2-2 summarizes square footage by residential, commercial, office, and other land uses for the potential development and the high development density cases. Appendix E provides square footage and land use information for each development.

**Exhibit 2-2: Summary of Dwelling Units and Total Square Footage in the Friendship Heights Area**

| | Residential (Dwelling Units)[1] | Commercial (SF) | Office (SF) | Other (SF) | Total (SF) |
|---|---|---|---|---|---|
| **Potential Development Case (WACTS Scenario 2 in Friendship Heights)** | | | | | |
| Current Construction Projects | 540 | 525,000 | 746,223 | 20,500[2] | 1,966,723 |
| Friendship Heights Addendum Developments | 1,306 | 857,314 | 56,250 | 111,860[3] | 2,657,924 |
| Potential Development in Immediate DC/MD Border (GEICO) | 500 | 0 | 845,000 | 0 | 1,470,000 |
| **Total** | **2,346** | **1,382,314** | **1,647,473** | **132,360** | **6,094,647** |
| | | | | | |
| **High Density Development Case (WACTS Scenarios 3 and 4 in Friendship Heights)** | | | | | |
| Current Construction Projects | 540 | 525,000 | 746,223 | 20,500[2] | 1,966,723 |
| Friendship Heights Addendum Developments | 1,705 | 1,315,437 | 56,250 | 111,860[3] | 3,614,797 |
| Potential Development in Immediate DC/MD Border (GEICO) | 500 | 0 | 845,000 | 0 | 1,470,000 |
| **Total** | **2,745** | **1,840,437** | **1,647,473** | **132,360** | **7,051,520** |

1) Dwelling units (DU) are converted into square footage using a multiplier of 1,000 sf. per unit. The square footage is increased by 20 % to accommodate common area.
2) Square footage represents the community center.
3) Square footage represents the hotel.

## 2.3 DEVELOPMENT TRIP GENERATION METHODOLOGY

There are three major components to the estimate of future conditions: 1) background growth, 2) new trips associated with development projects that are under construction or scheduled for construction in the near future, and 3) new trips associated with future development. The same background growth rates used for the Friendship Heights Transportation Study were applied in this study. The Study Team identified three developments under construction to be considered in the Friendship Heights study: Chase Point (DC), Chevy Chase Center (Maryland), and Hecht's (Maryland). In response to resident comments, the office land use for the Chase Tower development and associated trips were also added to the analysis.[3]

### *2.3.1 Development Traffic*

The standard practice recommended by the Institute of Transportation Engineers (ITE) was followed to estimate the trips associated with developments in Friendship Heights. The

[3] The commercial portion of the Chase Tower development was occupied at the time data collection was conducted.

methodology begins with a base trip generation rate for a particular type of facility (e.g., mid-rise apartment complex or office), expressed in terms of an independent variable (e.g., number of dwelling units or gross square footage). The Study Team employed the trip rates developed by the ITE Trip Generation 7th Edition. The base rates are for the most part typical of suburban development, as evidenced by the source studies for the data. Therefore, base trip generation rates are typically adjusted upward or downward, based on specific local characteristics (e.g., a rural, town, small urban or large urban setting, and absence or presence and intensity of transit.).

These ITE base trip generation rates were then multiplied by the appropriate independent variable (e.g., number of dwelling units or gross square footage). The resulting number of trips for each type of facility was then reduced by a specific percentage based on whether the development is commercial or residential and its proximity to a Metrorail station. After adjusting the total number of trips generated for parcels, (by multiplying the trips generated by the trip reduction percentages), the trips are distributed on the street network following the trip patterns demonstrated in the traffic counts gathered at selected intersections in the study area. Individual development trip estimates are summarized in Appendix A.

## 3 EVALUATION OF FRIENDSHIP HEIGHTS TRANSPORTATION STUDY SHORT-TERM AND LONG-TERM IMPROVEMENTS

Future conditions for the intersections studied in the 2003 FHTS were reanalyzed to take into account the additional FHTSA developments (potential development case – WACTS Scenario 2). The Study Team conducted the future condition analysis incorporating the improvement recommendations from the FHTS. Future conditions are measured in levels of service (LOS). The LOS analysis uses a six-tier ranking from A to F to evaluate overall intersection capacity compared to existing traffic volume. Appendix B provides the definition of LOS for signalized and unsignalized intersections. LOS A indicates a free flow and LOS F represents an intersection capacity failure condition with long delays. LOS E and F for signalized intersections are generally considered unacceptable, and do not meet DDOT standards. Further discussion (and intervention, where feasible) focuses on intersections that fall to LOS E or F. Exhibit 3-1 compares the initial study LOS to the LOS with additional developments. However, for ease of reference, all changes in LOS are in **bold**.

**Analysis**: Additional development at the levels posed in the FHTSA will worsen traffic conditions at various intersections, with the greatest effects in the afternoon peak. In particular, the Wisconsin Avenue intersections with Jenifer Street and Harrison Street and the Western Avenue/Jenifer Street intersections fall to LOS E during the afternoon peak hour, if no additional improvements are made. LOS at Garrison Street, which is an unsignalized intersection, remains at F, however, increased traffic volume along Wisconsin Avenue will extend the waiting time for drivers from Garrison Street.

The detailed capacity analysis results for FHTS intersections are presented in Appendix C.

**Exhibit 3-1: Comparison of FHTS 2014 LOS with Future Condition with Additional Developments**

| ID # | Intersections | FHTS Future Condition with FHTS Improvements | | Future Condition with FHTS Improvements – Plus Additional Developments | |
|---|---|---|---|---|---|
| | | AM Peak | PM Peak | AM Peak | PM Peak |
| 1 | Western Ave. @ 41st St. NW | C | C | C | C |
| 2 | Western Ave. @ Military Rd. N.W. | B | B | B | **C** |
| 3 | Wisconsin Ave. @ Western Ave. N.W. | C | C | C | **D** |
| 4 | Western Ave. @44th St. N.W. | A | A | A | A |
| 5 | Western Ave. @ Jenifer St. N.W. | C | C | C | **E (D)** [2] |
| 6 | Wisconsin Ave. @ Jenifer St. N.W. | B | C | **C** | **E (D)** [2] |
| 7 | Wisconsin Ave. @ Harrison St. N.W. | A | A | **B** | **D** |
| 8 | Wisconsin Ave. @ Garrison St. N.W. [1] | F | F | F | F |
| 9 | Wisconsin Ave. @ Fessenden St. N.W. | B | B | **C** | **D** |
| 10 | Military Rd. @ 43rd St. N.W. [1] | C | C | C | **D** |
| 11 | Military Rd. @ 41st St. N.W. | B | A | B | **B** |
| 12 | Military Rd. @ Reno Rd. N.W. | B | C | B | **B** |

Notes:
1. These are unsignalized intersections. Levels of service at these intersections were measured based on the Highway Capacity Manual Unsignalized Intersection Capacity Analysis. Delay is for minor street approach only.
2. (D) indicates LOS with additional signal optimization. (See Section 3.1).

## 3.1 POTENTIAL MITIGATION MEASURES

Mitigation measures that are relatively easy to implement, such as signal timing and phasing modifications and lane utilization changes, were previously recommended as part of the 2003 FHTS. The Study Team reevaluated signal timing for intersections with deteriorated LOS. For two intersections, another round of optimization of signal timing improved LOS from E to D as seen in Exhibit 3-1.

- Western Avenue at Jenifer Street From LOS E to LOS D (PM Peak only)
- Wisconsin Avenue at Jenifer Street From LOS E to LOS D (PM Peak only)

Additional mitigation measures to improve FHTS intersection LOS generally will require more extensive infrastructure improvements, up to and including physical widening of the roadway. The following improvements could be considered for long term mitigation to improve LOS and decrease delay:

- Wisconsin Ave. @ Western Ave. N.W. – Add a right turn lane for SB traffic.
- Wisconsin Ave. @ Jenifer St. N.W. – Add a left turn lane for NB traffic.
- Remove parking on the Jenifer St. EB approach to provide three approach lanes.
- Wisconsin Ave. @ Garrison St. N.W. – Eliminate left turns during peak hours
- Military Rd. @ 43rd St. N.W. - Eliminate left turns during peak hours

Such improvements can be further evaluated and potentially implemented in concert with proposed new developments. As part of the Wisconsin Avenue Corridor Transportation Study, a recommendation to install left turn and through/right turn movement lane markings and lane use signage was proposed at the Wisconsin Avenue/Fessenden Street intersection. Implementation of

this improvement can be performed within the existing roadway configuration. Separating left-turn movements from through movements will improve traffic flow at this approach.

## 3.2 WISCONSIN AVENUE CORRIDOR TRANSPORTATION STUDY SCENARIO IMPACT ON FHTS INTERSECTIONS

The Study Team conducted a supplemental analysis to assess the impact of the WACTS scenarios with FHTS intersections. Based on the LOS analysis discussed above, additional traffic generated from the WACTS Scenarios 2 through 4 were added to the FHTS intersections. The FHTS background growth rate was adjusted to reflect the double counting of traffic generated by the WACTS scenarios. (Since Scenario 1 is the "No Build" case, no separate Scenario 1 impact analysis was required.) LOS analysis showed that some of the FHTS intersections will fail with additional traffic from WACTS scenarios. The Study Team evaluated the feasibility and potential for additional signal optimization where the intersections failed. The following Exhibits 3-2 and 3-3 show the LOS analysis results for AM and PM peak hours with additional signal optimization at the Wisconsin Avenue intersections at Western Avenue, Jenifer Street, Harrison Street, and Fessenden Street intersections and the Western Avenue/Jenifer Street intersection. Changes in LOS from one scenario to the next are in **bold**.

**Exhibit 3-2: Future 2014 WACTS Scenario Traffic Impact on FHTS Intersections with Signal Timing Optimization - AM Peak Hour**

| ID # | Intersections | Future Condition with FHTS Improvements – Plus Additional Developments | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|---|
| 1 | Western Ave. @ 41st St. NW | C | C | C | C |
| 2 | Western Ave. @ Military Rd. N.W. | B | B | B | B |
| 3 | Wisconsin Ave. @ Western Ave. N.W. | C | **D** | **D** | **D** |
| 4 | Western Ave. @44th St. N.W. | A | A | A | A |
| 5 | Western Ave. @ Jenifer St. N.W. | C | C | C | C |
| 6 | Wisconsin Ave. @ Jenifer St. N.W. | C | C | C | C |
| 7 | Wisconsin Ave. @ Harrison St. N.W. | B | **D** | **D** | **D** |
| 8 | Wisconsin Ave. @ Garrison St. N.W. [1] | F | F | F | F |
| 9 | Wisconsin Ave. @ Fessenden St. N.W. | C | C | C | C |
| 10 | Military Rd. @ 43rd St. N.W. [1] | C | C | C | C |
| 11 | Military Rd. @ 41st St. N.W. | B | B | B | B |
| 12 | Military Rd. @ Reno Rd. N.W. | B | B | B | B |

Notes:
1. These are unsignalized intersections. Levels of service at these intersections were measured based on the Highway Capacity Manual Unsignalized Intersection Capacity Analysis. Delay is for minor street approach only.
2. The "FHTS Future Condition with Additional Developments" is not comparable to Scenario 1 of the WACTS, as it includes multiple developments in the Friendship Heights not currently scheduled or under construction.

**Exhibit 3-3: Future 2014 WACTS Scenario Traffic Impact on FHTS Intersections with Signal Timing Optimization - PM Peak Hour**

| ID # | Intersections | Future Condition with FHTS Improvements – Plus Additional Developments | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|---|
| 1 | Western Ave. @ 41st St. NW | C | C | C | C |
| 2 | Western Ave. @ Military Rd. N.W. | C | C | C | C |
| 3 | Wisconsin Ave. @ Western Ave. N.W. | D | D | **E** [3] | **E** [3] |
| 4 | Western Ave. @44th St. N.W. | A | A | A | A |
| 5 | Western Ave. @ Jenifer St. N.W. | E (D) [2] | D [3] | **E** | **E** |
| 6 | Wisconsin Ave. @ Jenifer St. N.W. | E (D) [2] | E [3] | **F** | **F** |
| 7 | Wisconsin Ave. @ Harrison St. N.W. | D | D [3] | **F** | **F** |
| 8 | Wisconsin Ave. @ Garrison St. N.W. [1] | F | F | F | F |
| 9 | Wisconsin Ave. @ Fessenden St. N.W.[4] | D | D | D | D |
| 10 | Military Rd. @ 43rd St. N.W. [1] | D | D | D | E |
| 11 | Military Rd. @ 41st St. N.W. | B | B | B | B |
| 12 | Military Rd. @ Reno Rd. N.W. | B | B | B | B |

Notes:
1. These are unsignalized intersections. Levels of service at these intersections were measured based on the Highway Capacity Manual Unsignalized Intersection Capacity Analysis. Delay is for minor street approach only.
2. These are the intersections where additional signal timing optimization was performed. – See Exhibit 3-1.
3. Additional signal optimization was undertaken at intersections where LOS changed.
4. The "FHTS Future Condition with Additional Developments" is not comparable to Scenario 1 of the WACTS, as it includes multiple developments in the Friendship Heights area not currently scheduled or under construction.

**Analysis**: For the AM Peak, eight (8) of the ten (10) signalized intersections maintain LOS C or better for Scenarios 2, 3 and 4. The other two intersections achieve LOS D, representing moderate delay in the AM Peak period. By contrast, for the PM Peak, only five (5) of the ten (10) signalized intersections achieve LOS C or better for Scenarios 2 through 4. The additional developments along Wisconsin Avenue push the LOS from D to E for the intersection at Wisconsin and Jenifer Street for Scenario 2, and to F for Scenarios 3 and 4. Other signalized intersections are at LOS D or better for the afternoon peak hour for Scenario 2, with multiple failures for Scenarios 3 and 4.

With the development levels postulated in Scenarios 3 and 4, LOS will reach E or even F for the Wisconsin Avenue intersections at Western Avenue, Jenifer Street and Harrison Street and the intersection of Western Avenue and Jenifer Street. Long-term improvements and mitigation measures as discussed in Section 3.1 would be required in order to relieve intersection congestion and reduce delay time if the area were to embark on development at the levels hypothesized in Scenarios 3 and 4. Such improvements and mitigation measures can be evaluated and undertaken in tandem with future development projects.

# 4 RIVER ROAD EXISTING AND FUTURE CONDITIONS

River Road and Western Avenue are two key roadways within the District of Columbia (District) which border or cross the border with Maryland. These roadways are used by travelers with various trip purposes such as commuting, business, recreational uses, etc. Three key intersections along River Road were selected for detailed examination in response to residents' requests: 1) at Western Avenue, 2) at 46th Street, and 3) at Garrison Street. The intersections at 46th Street and Garrison Street were analyzed together because of their proximity and the fact that the signals are operated as a single signal system. The following section provides a physical description of the River Road, Western Avenue, 46th Street and Garrison Street roadways and the River Road intersections.

## 4.1 ROADWAY CHARACTERISTICS

**River Road**

River Road is a two-way, two lane minor arterial roadway within the District that becomes a four lane undivided minor arterial roadway in the state of Maryland, traveling in a northwest-southeast direction. The posted speed limit along River Road in the District is 25mph and increases to 30 mph when the roadway enters Maryland, north of Western Avenue. Left-turns are restricted for northbound River Road at Western Avenue and southbound at 46th Street/ Garrison Street. Parking is restricted along southbound River Road from the Maryland border to the 46th Street/Garrison Street intersection. Parking is allowed in the northbound direction except between 4:00PM and 6:30PM. Exhibit 4-1 illustrates the lane use configuration at these intersections.

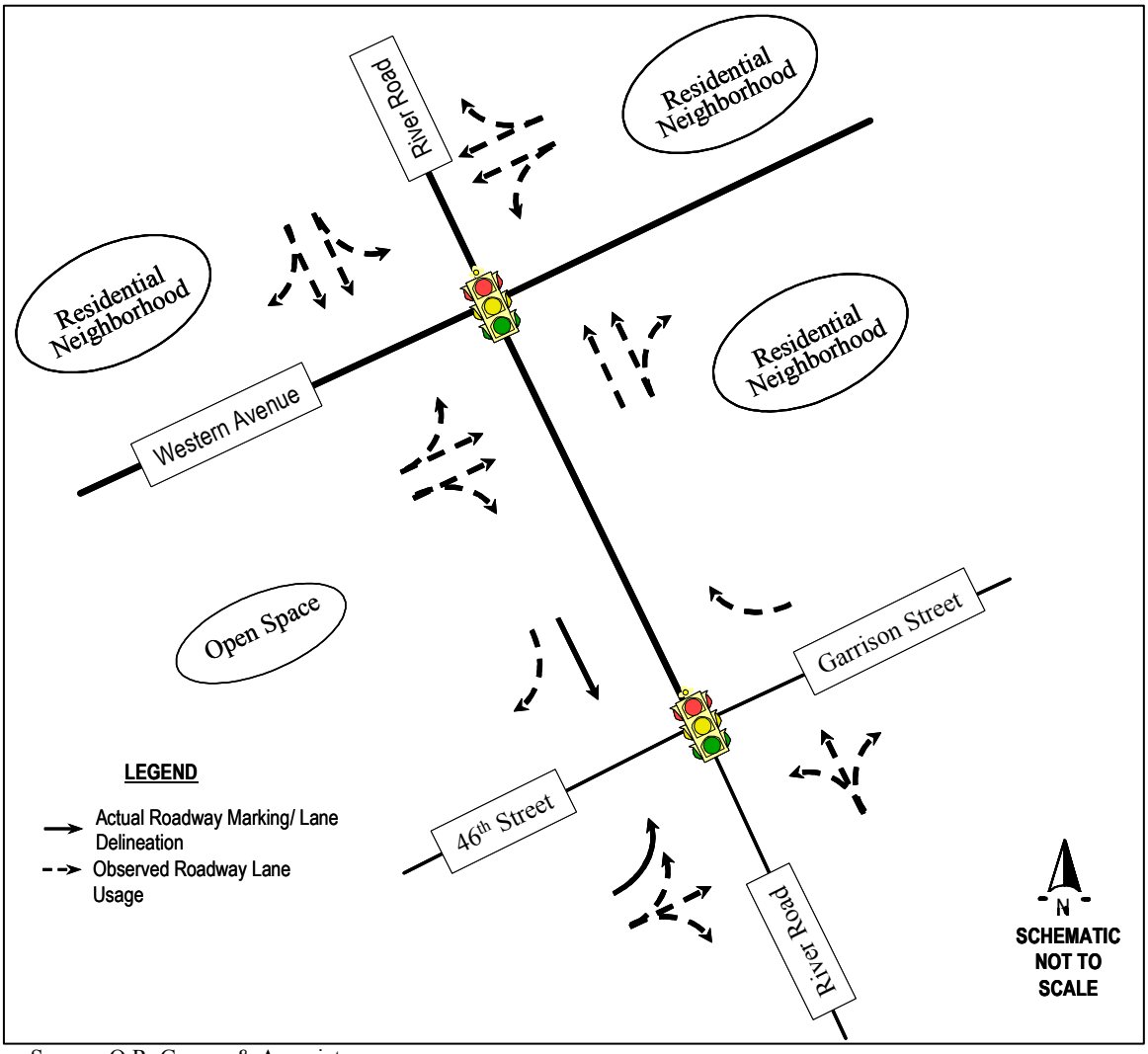
**Western Avenue**

Western Avenue is a two-way, four lane minor arterial that traverses in a northeast-southwest direction. The posted speed limit is 25 mph. There is no turning movement restriction at the Western Avenue/River Road intersection. No on-street parking is allowed in this section of Western Avenue.

**Garrison Street and 46th Street**

Garrison Street/ 46th Street intersection at River Road is a four-leg intersection, connecting to River Road westward from Garrison Street (local street) and northeastward from 46th Street (collector road) connecting to River Road. For the Garrison Street approach, only the right-turn movement is allowed at the intersection.

**Exhibit 4-1: Lane Usage**




Source: O.R. George & Associates

## 4.2 DATA COLLECTION

Residents identified transportation related issues and expressed concerns regarding River Road intersections during public meetings for the Friendship Heights Transportation Study (2003) and Wisconsin Avenue Corridor Transportation Study (2004 – November 2005). The Study Team, with DDOT guidance, identified the following issues as the key concerns raised for the River Road intersections at Western Avenue, Garrison Street, and 46th Street:

- Queuing along River Road during peak hours
- Safety concerns for pedestrians attempting to cross River Road
- Safety concerns for vehicles crossing River Road
- Safety concerns for vehicles associated with permitted parking along northbound River Road near Western Avenue
- Cut-through traffic into neighborhood streets especially when River Road is congested

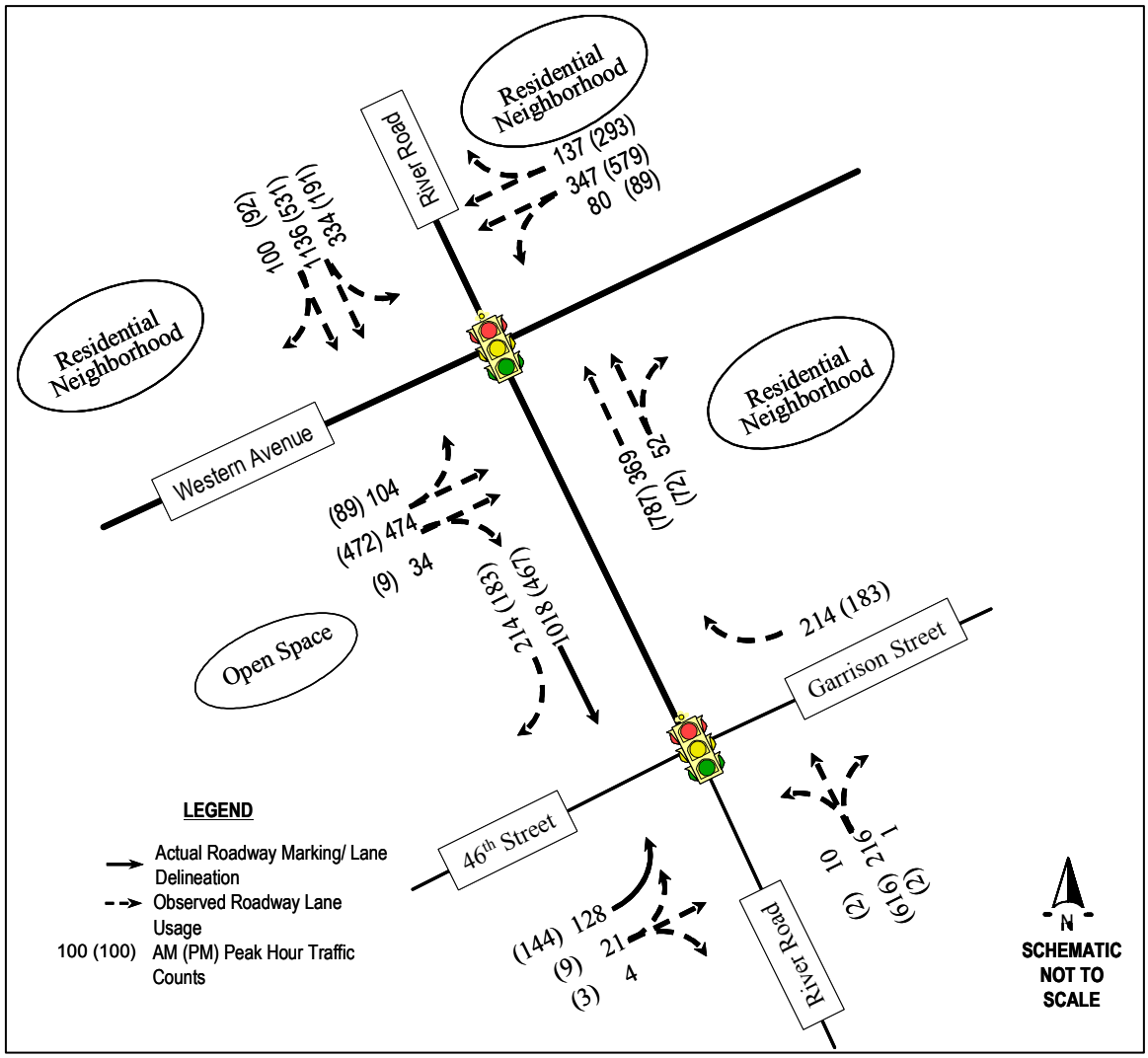
- Residents have expressed concern about likely truck traffic and congestion that would result from selection of the preferred proposed route for removal of residual waste from the Dalecarlia Reservoir. That proposed route includes the intersection of Western Avenue and River Road.

Data collection for the River Road intersections was designed to illuminate the above transportation issues and concerns. The data collection and analyses were undertaken in accordance with traffic engineering principles and procedures established by the Institute of Transportation Engineers (ITE) and the Federal Highway Administration (FHWA). In order to collect representative data and field observations, data was collected on a "typical" weekday (e.g., mid-week, sunny day, etc.) which was not impacted by national and local holidays, or by unfavorable weather, or other factors such as traffic accidents. Note: Dalecarlia Reservoir traffic effects are included in the "Future Condition" analysis.

### *4.2.1 Traffic Condition*

The peak hour traffic counts and queuing field observations were conducted in March 2005. The counts were collected during morning (from 6:30AM to 9:30AM) and afternoon (from 4:00PM to 7:00PM) peak-periods, on a typical weekday (Tuesday, Wednesday, or Thursday). The turning movement volumes shown in Exhibit 4-2 show that River Road carries a significant level of through/commuter traffic in the peak hour direction. As shown in Exhibit 4-2, the dominant weekday morning and afternoon peak hours occur within the periods 8:00 – 9:00 AM and 5:15 – 6:15 PM, respectively. The overwhelming peak period directional traffic movement along River Road is southbound during the morning peak hour, with an average southbound - northbound split of approximately 78% - 22%. The reverse (northbound) movement is less pronounced during the afternoon peak period, with the average northbound - southbound split at 52% - 48%. Detailed turning movement counts are provided in Appendix D.

**Exhibit 4-2: Peak Hour Traffic Counts**




Source: O.R. George & Associates and the Louis Berger Group

### *4.2.2 Queuing Observation*

The Study Team observed queuing at River Road and Western Avenue during morning and afternoon peak hours. Because River Road is a significant northwest-southeast roadway and Western Avenue is a key east-west road, their intersection tends to create long vehicular queues especially during peak hours, causing significant travel delays for many travelers.

There are four approaches at this intersection. As Exhibit 4-3 shows, the worst queuing was observed in the morning peak hour for both approaches on Western Avenue. During the AM peak hour, on average, 35 percent of westbound vehicles and 57 percent of eastbound vehicles were able to clear the intersection in one signal cycle. In other words, the majority of vehicles traveling westbound on Western Avenue needed to wait through two or more signal cycles in order to cross the intersection during the AM peak hour. One signal cycle at this intersection is 100 seconds.

During peak hours, River Road has queues in the non-peak traffic flow direction because the signal time is synchronized to facilitate the peak flow travel. More detailed queuing observation results are provided in Appendix E.

**Exhibit 4-3: Queuing Observation – Percent Cleared During One Signal Cycle (number of vehicles)**

| | River Road | | Western Avenue | |
|---|---|---|---|---|
| | **Northbound** | **Southbound** | **Eastbound** | **Westbound** |
| **AM Peak Hour** | | | | |
| Average Queue | 13 | 26 | 28 | 46 |
| Maximum Queue | 20 | 37 | 40 | 60 |
| Percent Clearance | 85% | 100% | 57% | 35% |
| **PM Peak Hour** | | | | |
| Average Queue | 9 | 26 | 20 | 34 |
| Maximum Queue | 19 | 41 | 32 | 48 |
| Percent Clearance | 100% | 81% | 80% | 71% |

### *4.2.3 Safety*

An assessment of safety conditions in the study area is an important facet in understanding existing road conditions. The Study Team obtained accident data from the District Department of Transportation (DDOT) from 2000 through 2003. As shown in Exhibit 4-4, there are no significant traffic safety deficiencies at the River Road intersections, based on the accident data and analysis.

Field observation concludes that due to a sharp angle especially from Garrison Street and 46$^{th}$ Street to River Road and poor visibility, it is difficult to turn onto River Road. This "natural" turning impediment may contribute to the small number of accident cases reported.

**Exhibit 4-4: Accident Summary**

| Intersections | Accident Summary (2000-2003) | Type of Collision |
|---|---|---|
| River Road at Western Avenue | 3 | 2 Right-angle and 1 rear-end |
| River Road at 46$^{th}$ Street/ Garrison Street | 1 / 2 | side swipe and rear end |

Source: DDOT

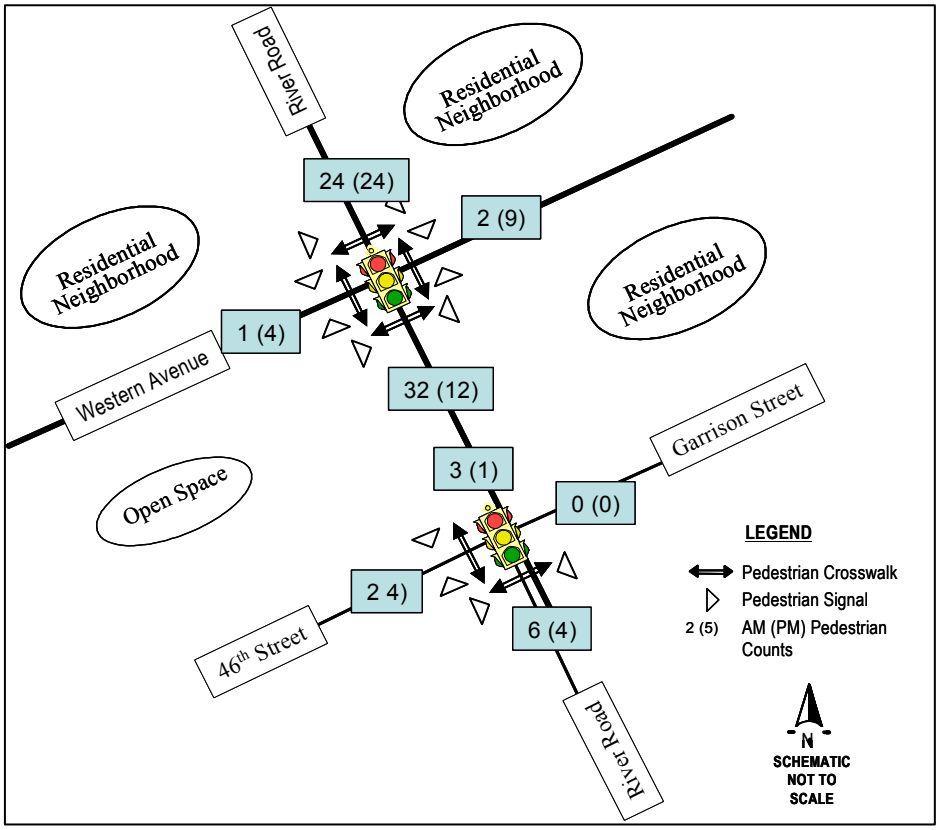
Detailed accident data for each intersection is provided in Appendix F.

### *4.2.4 Pedestrian Crossings*

Pedestrian movements were recorded at the River Road/Western Avenue and River Road/ Garrison Street/46$^{th}$ Street intersections. Pedestrian volume counts were collected during the weekday peak periods to identify critical intersections for both vehicular and pedestrian crossing safety. As shown in Exhibit 4-5, pedestrian movements were limited, but were more extensive at the River Road/Western Avenue intersection than at the River Road/Garrison Street/46$^{th}$ Street intersection. The pedestrian crossing data collection observed from 12 to 32 pedestrians;

however, heavy left-turn vehicle movements permitted from Western Avenue could conflict with and inhibit pedestrian crossing movements. Nevertheless, the accident summary in Section 4.2.3 showed that very few incidents occurred at the River Road/Western Avenue intersection and none involved pedestrians. Complete pedestrian crossing data is provided in Appendix G.

**Exhibit 4-5: Peak Hour Pedestrian Crossing Counts**




Source: O.R. George & Associates

### *4.2.5 Level of Service Analysis*

Existing conditions of roadways and intersections are measured in levels of service (LOS). As described in Section 3, the LOS analysis uses a six-tier ranking from A to F to evaluate overall intersection capacity compared to existing traffic volumes. LOS A indicates a free flow and LOS F represents an intersection capacity failure condition with long delays. Signalized intersections at LOS E and F are generally considered unacceptable, and will be the focus of further discussion and intervention, where possible.

Exhibit 4-6 summarizes the existing LOS for the River Road intersections for the weekday morning and afternoon peak hours. LOS results indicate that the intersection of River Road and Western Avenue is reaching its capacity. Average delay time at this intersection was approximately one minute during peak hours. The major contributors to poor LOS are the variety of turning movements allowed at this intersection, combined with heavy traffic volumes. There are four phases at this intersection which further exacerbates the LOS.

**Exhibit 4-6: Existing Level of Service**

| ID # | **Intersections** | **AM Peak** | **PM Peak** |
|---|---|---|---|
| 1 | River Rd. @ Western Ave, N.W. | **E** (77 seconds) | **E** (59 seconds) |
| 2 | River Rd. @ Garrison St. & 46th St. N.W. | D (38 seconds) | B (15 second) |

Details on 2005 intersection capacity analysis results are presented in Appendix H.

## 4.3 FUTURE LEVELS OF SERVICE WITHOUT IMPROVEMENTS

Future traffic conditions were analyzed using Synchro and the same methodology utilized to analyze the LOS under existing conditions. Exhibit 4-7 shows the results of the future traffic analysis, prior to evaluating the impact of proposed improvements. The future analysis included all developments considered under the "potential development case" in Friendship Heights, which was discussed in Section 2.1, as well as potential truck traffic from the proposed route for the Dalecarlia Reservoir Residual Removal[4]. As expected, the LOS worsens over time since the traffic volumes increase. In the absence of infrastructure and operational improvements, future LOS at the River Road/Western Avenue intersection will fail in the morning and afternoon peak hours. LOS at the River Road/ 46th Street/Garrison Streets intersection will maintain the same LOS.

**Exhibit 4-7: 2014 Future Levels of Service**

| ID # | Intersections | **Future Condition (2014)** | |
|---|---|---|---|
| | | **AM Peak** | **PM Peak** |
| 1 | River Rd. @ Western Ave, N.W. | **F** | **F** |
| 2 | River Rd. @ Garrison St. & 46th St. N.W. | D | B |
| Note: The future analysis includes potential development identified in FHTSA "potential development case." | | | |

Appendix H presents the detailed 2014 capacity analysis results for the River Road intersections.

[4] For this analysis, ten percent of the anticipated Dalecarlia-related truck traffic was assigned to each of the peak hours, although in common practice truck traffic strives to avoid urban travel during peak hours, if there is any choice; and in some cases, particular types of truck traffic may be restricted or prohibited during peak hours.

# 5 SHORT-TERM AND LONG-TERM IMPROVEMENT RECOMMENDATIONS

The Study Team compiled a comprehensive list of transportation issues to be considered for the study area. After the list was prepared, the Study team conducted field investigations, analysis and assessments of existing and future conditions. The Study Team then developed improvement recommendations.

The following section describes the various traffic issues which have been identified at the River Road intersections. For each issue identified, recommendations have been suggested to improve traffic operations along with an evaluation of the rationale for the recommendation. Each component of the section is presented as follows:

- Issues: states the concern, problem or need for improvement
- Recommended Short-Term Improvement(s): various solutions that could potentially address the issues and may be implemented within 12 months. This section includes a description of all the improvement alternatives considered in the evaluation. Based on the evaluation of the alternatives, some of the preliminary improvements may not be recommended for actual implementation.
- Recommended Long-Term Improvement(s): various solutions that could potentially address the issues, but the implementation would generally take longer than 12 months but less than 10 years.
- Evaluation(s): analysis of recommendations.

## 5.1 RIVER ROAD AND WESTERN AVENUE

**Looking East**

**Looking South**

*Issue(s):*

- Faded or missing pavement markings.
- Confusing lane use signage.
- Wheelchair ramps do not conform to ADA and DDOT standards.
- Extensive queues were observed, indicating that the intersection is over capacity.
- Queuing on River Road heading northbound can extend beyond Garrison Street, blocking that intersection.
- Improperly located speed limit sign.

- Overgrown vegetation obstructs visibility of signs.
- Large right-turn volume from Western Avenue westbound to River Road northbound.
- Short lane drop taper area for westbound Western Avenue traffic on the far side of the intersection.
- Large left-turn volume from River Road southbound to Western Avenue eastbound.
- Inefficient signal phasing for the Western Avenue approaches as each approach has its own exclusive phase.
- Parking on the northbound River Road approach blocks use of the right lane.

The following improvement recommendations are illustrated in Exhibit 5-1.

*Recommended Short Term Improvement(s):*

- Revise signal phasing by eliminating the split phases for Western Avenue and replacing with dual advance left turn phasing and concurrent through movements.
- Remove/clear vegetation overgrowth or relocate signs for better visibility.
- Restripe pavement markings.
- Relocate the speed limit sign closer to the intersection.
- Relocate / increase the lane drop taper for westbound traffic farther west on Western Avenue.
- Install mast arm signals for improved visibility.
- Restripe pedestrian crosswalks.

*Recommended Long Term Improvement(s):*

- Reconstruct wheel chair ramps to current ADA and DDOT standards.
- Eliminate parking on River Road between Garrison Street and Western Avenue.
- Widen Western Avenue 10 feet to the north to allow construction of left turn storage lanes for both the eastbound and westbound approaches (The sidewalk width will remain the same.)
- Widen the southbound approach of River Road 5 feet to the east and west to allow construction of a left turn storage lane on that approach. (The sidewalk width will remain the same.)

Although DDOT owns the necessary right-of-way to implement the improvement recommendations at River Road/Western Avenue, construction will require coordination with Maryland State Highway Administration (MDSHA), Maryland DOT, and the Maryland-National Capital Park and Planning Commission (M-NCPPC) since they affect both jurisdictions as well as other stakeholders. With agreement from the M-NCPPC and MDSHA, implementation of major roadway works can be implemented.

*Evaluation(s):*

- Optimizing the signal timing and improved coordination of signals along Western Avenue should improve capacity of the intersection by allowing more vehicles to pass through the signals at the Western Avenue and River Road intersection
- Clearing overgrown vegetation in front of the lane drop sign will make the sign more prominent and make drivers aware of the proper lane use.

- Relocating the speed limit signs will make the signs more prominent and make drivers aware of the legal speed limit
- Installation of mast arm signals for all approaches will make the signals more visible.
- Clear crosswalk markings increase driver visibility and increase pedestrian safety.
- Improved lane markings improve lane utilization, and increase safety and capacity.
- Improved signage provides clear and concise guidance, improves driver knowledge, and therefore increases safety.
- Construction of wheel chair ramps conforming to current standards provides better accessibility.
- Construction of a left turn storage lane for southbound River Road will remove the left turning vehicles from the through lane, providing increased capacity and improved safety.
- Construction of left turn storage lanes for both the eastbound and westbound Western Avenue approaches will allow for elimination of the inefficient split phase operation and facilitate dual left turn phasing and concurrent through movement.
- Providing improved capacity on the arterial roadways will reduce the amount of traffic attempting to cut-through residential neighborhoods.

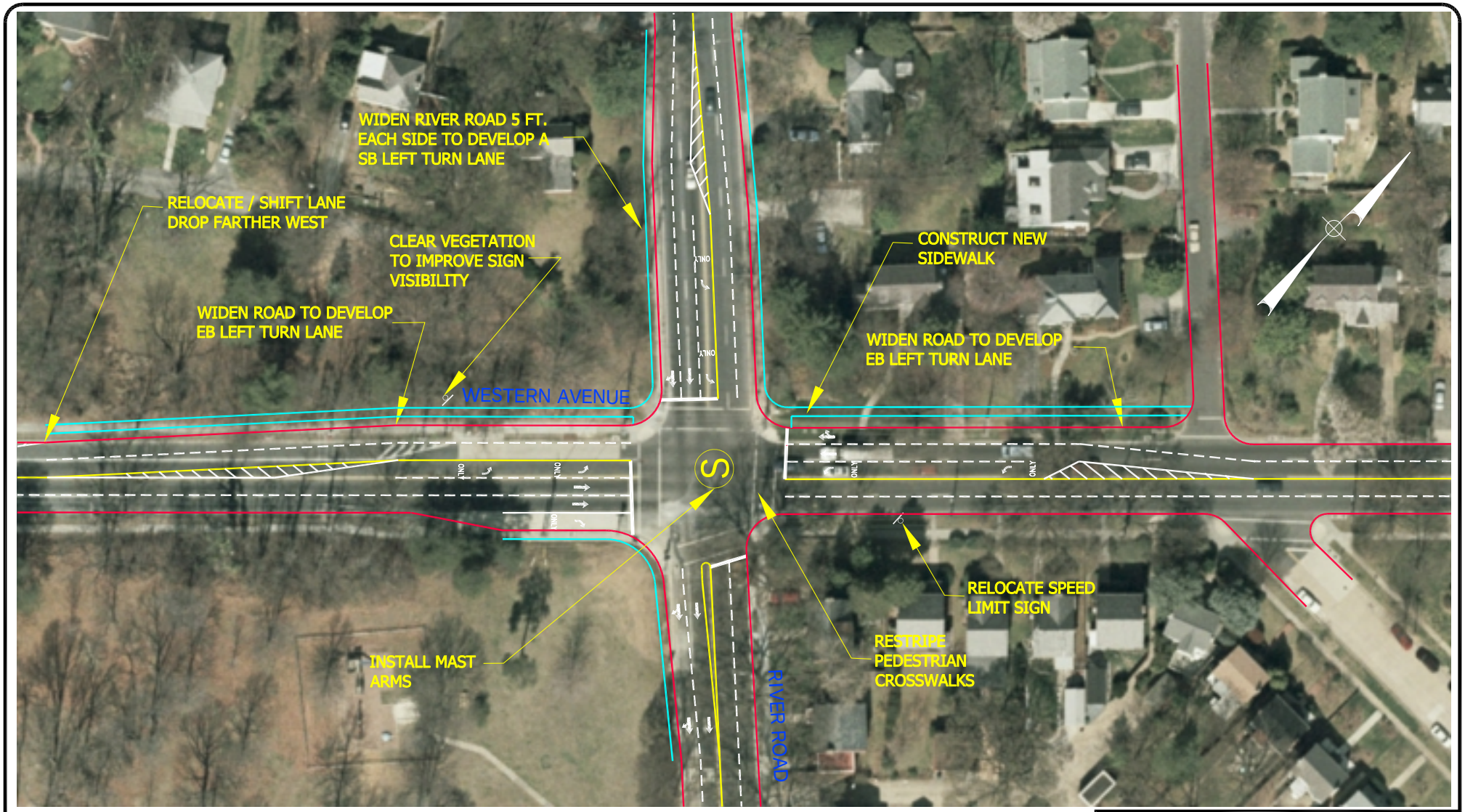



EXHIBIT 5-1:
WESTERN AVE. / RIVER ROAD

FRIENDSHIP HEIGHTS
TRANSPORTATION STUDY ADDENDUM

25 0 50 100

## 5.2 RIVER ROAD AND GARRISON STREET/46TH STREET


**Looking West**

**Looking North**

*Issues:*

- Overgrown vegetation obstructs visibility of signals.
- Faded or missing pavement markings.
- Signal timings and phasing need to be adjusted.
- Faded signs.
- Signal heads improperly aligned.
- Wheel chair ramps do not conform to ADA and DDOT standards.
- Queuing from the River Road / Western Avenue intersection on the northbound approach can extend beyond Garrison Street, blocking the intersection. (See Section 5.1 for recommendations)
- Parking is permitted too close to the intersection on the River Road northbound approach.

The following improvement recommendations are illustrated in Exhibit 5-2.

*Recommended Short Term Improvement(s):*

- Replace faded "No Parking Anytime" sign on 46th Street.
- Restripe pavement markings.
- Realign signal heads to properly face Garrison Street and northbound River Road, as appropriate.
- Install optically programmed signal heads to limit visibility to the appropriate approaches.
- Install mast arm signals on the River Road approaches for improved visibility.
- Restripe lane use markings on northbound River Road and on westbound 46th Street.
- Install graphical lane use signs on northbound River Road and on westbound 46th Street.
- On the River Road northbound approach, eliminate parking within 50 feet of the intersection.
- On the River Road northbound approach, restrict parking within 250 feet of the intersection during the PM peak hour (4:00 to 6:30 PM) to allow two-lane operation.
- Install "No Parking Any Time" signs on the northbound approach to Western Avenue between 46th Street and Western Avenue.

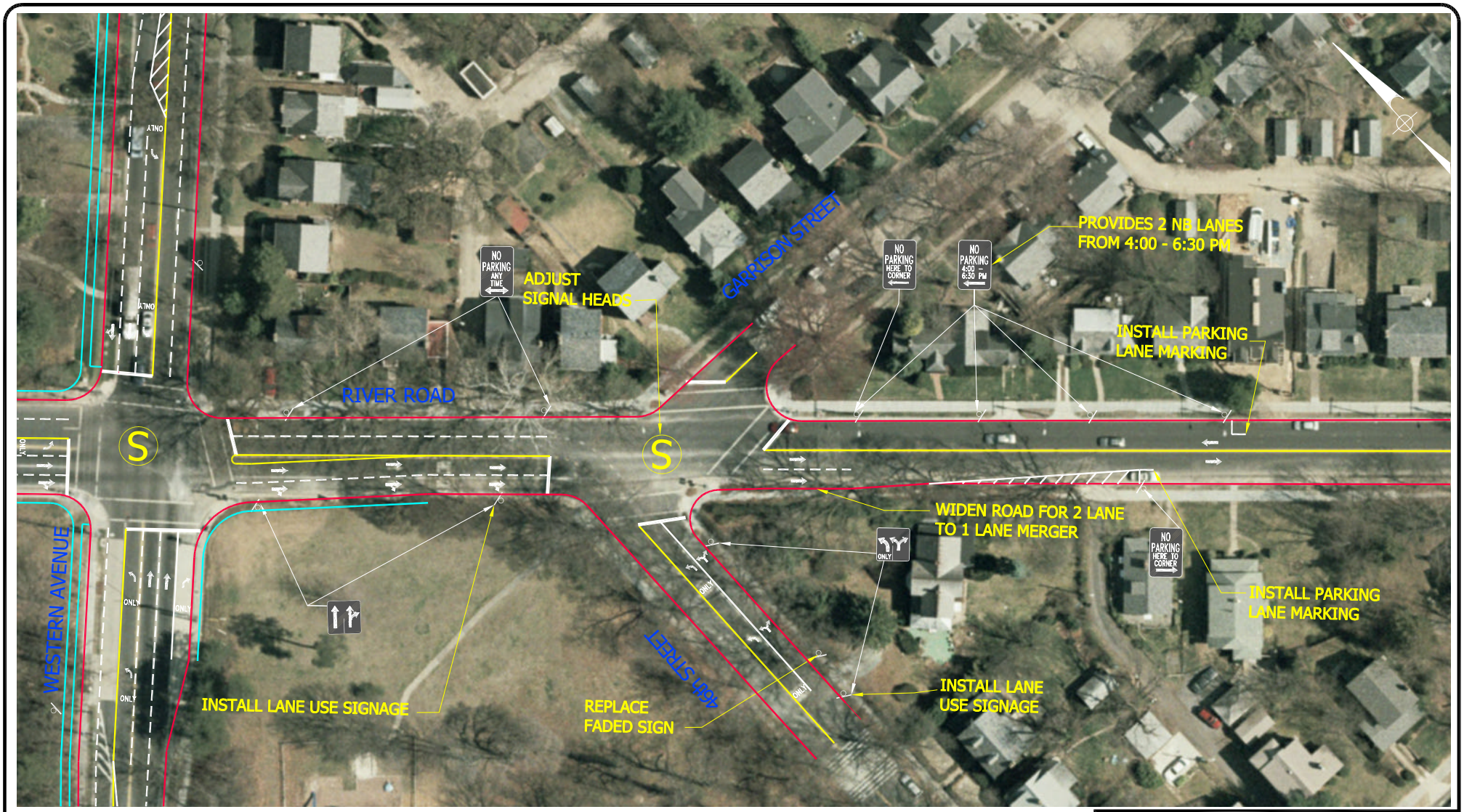



EXHIBIT 5-2:
RIVER ROAD / GARRISON STREET

FRIENDSHIP HEIGHTS
TRANSPORTATION STUDY ADDENDUM

25 0 50 100

*Recommended Long Term Improvement(s):*

- Widen southbound River Road to permit two lanes southbound through the intersection. Provide taper to one lane downstream of the intersection. Eliminate parking in the taper area.
- Change the lane use designation for the River Road southbound approach from one through lane and one right turn lane to one through lane and one through/right lane.

*Evaluation(s) for Long Term Improvement Recommendations:*

- Clear delineation of parking limits at the intersection corners improves sight distances for both pedestrians and vehicles and increases safety and capacity.
- Enhanced signing and pavement markings will improve operations and safety.
- Installation of mast arm signals will make the signals more visible and improve safety
- Providing two-lane operation for northbound flow will improve the capacity and reduce the queuing, reducing the potential for back-ups between the two closely-spaced intersections
- Providing two-lane operation for southbound flow will improve the capacity and reduce the queuing, reducing the potential for back-ups between the two closely-spaced intersections.
- Providing improved capacity on the arterial roadways will reduce the amount of traffic attempting to cut through residential neighborhoods.

## 5.3 FUTURE LEVELS OF SERVICE WITH RECOMMENDED IMPROVEMENTS

The Study Team analyzed the performance of the intersections for 2014 incorporating the recommended improvements, using the same procedures as for the existing condition analysis and the future condition analysis without improvements. The Study Team determined that the transportation improvements discussed in this report in tandem with signal optimization will improve the signalized intersections at River Road/Garrison Street/46th Street and River Road/Western Avenue intersections to LOS D or better. As shown in Exhibit 5-3, River Road intersections maintain LOS D or better, including under all scenarios discussed in Section 3.2.

**Exhibit 5-3: Comparison of Future Levels of Service for River Road Intersections – AM and PM Peak Hours**

| ID # | Intersections | Future LOS with Improvements (plus FHTSA Developments) | With WACTS Scenario 2 | With WACTS Scenario 3 | With WACTS Scenario 4 |
|---|---|---|---|---|---|
| **AM Peak Hour** | | | | | |
| 1 | River Rd. @ Western Ave, N.W. | D | D | D | D |
| 2 | River Rd. @ Garrison St. & 46th St. N.W. | B | B | B | B |
| **PM Peak Hour** | | | | | |
| 1 | River Rd. @ Western Ave, N.W. | D | D | D | D |
| 2 | River Rd. @ Garrison St. & 46th St. N.W. | B | B | B | B |

# 6 SUMMARY

The main goals of the FHTSA were to 1) identify future traffic conditions related to anticipated development in Friendship Heights, and evaluate the effectiveness of proposed traffic improvement measures; and 2) examine existing and future transportation conditions and identify traffic engineering solutions to improve traffic and pedestrian safety and reduce traffic congestion, especially during morning and evening peak hours for the River Road intersections at Western Avenue and 46th Street/Garrison Street. The Scope of Work for the FHTSA is provided in Appendix I.

**Friendship Heights**
The varying levels of development both anticipated and simulated for the Friendship Heights area and the WACTS yield proportionate impacts in traffic and LOS. The following is a summary of the reevaluation of FHTS intersections where LOS falls to LOS D or below.

1. The additional FHTSA developments in Friendship Heights have a moderate impact in the afternoon peak hour. The Wisconsin Avenue/Jenifer Street intersection and the Western Avenue/Jenifer Street intersection will maintain LOS D with signal timing optimization.
2. When the additional traffic from WACTS Scenario 2 is superimposed on the area, additional intersections deteriorate. The Wisconsin Avenue intersections at Western Avenue and Harrison Street go from LOS C and B (respectively) to D in the morning peak hour. The Wisconsin Avenue/Jenifer Street intersection goes from LOS D to E in the afternoon peak hour.
3. Scenarios 3 and 4 present serious congestion and failures at a half of the signalized intersections studied.

**River Road**
The Study Team, with DDOT guidance, identified that major transportation problems are queuing along River Road and Western Avenue during peak hours, pedestrian and vehicular safety concerns, and possible cut-through traffic into neighborhood streets due to long back-ups.

The Study Team concludes that the transportation improvements discussed in this report in tandem with signal optimization will improve the signalized intersections at River Road/Garrison Street/46th Street and River Road/Western Avenue intersections to LOS D or better under all scenarios.

Recommendations of both short-term (within 12 months) and long-term (over 12 months) implementation must still go through an appropriate DDOT process. Specific projects, if approved, will be conducted based on available capital funds. As indicated earlier, the coordination with MDSHA, Maryland DOT, and M-NCPPC will be a key to a successful implementation of capacity improvements at the River Road/Western Avenue intersection. If no agreement is reached between the District and M-NCPPC, the intersection will fail and drivers will seek alternate routes, probably cutting through local streets. Planning cost estimates of these improvements are presented in Appendix J.